

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of)	
)	
GERARD BENARD, ERIC DUPREY,)	
PATRICK MOUREAUX, and)	
JOHANNES A. R. VAN VEEN)	Confirmation No.: 6950
)	
Serial No. 10/537,977)	Group Art Unit: 1797
)	
Filed June 9, 2005)	Examiner: Taiwo Oladapo
)	
PROCESS FOR THE PREPARATION)	July 23, 2009
OF A LUBRICANT)	
)	

COMMISSIONER FOR PATENTS
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Sir:

APPEAL BRIEF

This brief is filed in support of Applicant's appeal from the Examiner's action mailed March 5, 2009, finally rejecting claims 1-25 of the above-identified U.S. patent application. A notice of appeal from this decision was filed by Applicant on June 3, 2009.

Please charge the fee for filing this brief to Shell Oil Company Deposit Account No. 19-1800.

It is respectfully requested that the Board reverse the final rejection of claims 1-25 of the above-identified application for the reasons discussed below.

REAL PARTY IN INTEREST

The invention described and claimed in the above-identified patent application is assigned to Shell Oil Company, which is the real party in interest in the present appeal.

RELATED APPEALS AND INTERFERENCES

Appellant and Appellant's legal representatives are not aware of any related appeals or interferences.

STATUS OF CLAIMS

Claims 1-25 have been rejected and are the subject of this appeal. A copy of the claims on appeal can be found in the Claims Appendix.

STATUS OF AMENDMENTS

There are no outstanding amendments.

SUMMARY OF CLAIMED SUBJECT MATTER

The following is a summary of the claimed subject matter with specific reference to the portions of the specification that support the various claim limitations.

Claim 1, the only independent claim, claims a process to prepare a lubricant having a dynamic viscosity at -35°C of below 5000 cP by performing the following three steps:

- (a) hydrocracking a feed containing more than 50 wt% wax by contacting said feed in the presence of hydrogen with a catalyst comprising a Group VIII metal component supported on a refractory oxide carrier under hydrocracking conditions sufficient to achieve between 40 and 70 wt% wax conversion; and
- (b) catalytically dewaxing at least part of the effluent of step (a) with a catalyst composition comprising a noble Group VIII metal, a binder and zeolite crystallites of the MTW type to obtain a base oil product in high yield having a pour point below -10°C and having a viscosity index greater than 120; and
- (c) adding a pour point depressant additive to the base oil product obtained in step (b) thereby obtaining a lubricant having a dynamic viscosity at -35°C of below 5000 cP. (Page 2, lines 1-16; page 14, lines 19-21 and page 19, lines 32-33).

Dependent claim 2, which is being argued separately, claims the process of claim 1, wherein the base oil product in step (b) has a pour point below -20 °C and a viscosity index greater than 130 and below 180. (Page 19, line 33, to page 20, line 2).

Dependent claim 7, which is being argued separately, claims the process of claim 6, wherein the wax containing feed is derived from a Fischer-Tropsch process, the Group VIII metal in step (a) is platinum and/or palladium and wherein the total effluent of step (a) is used as feed to step (b) in a series flow configuration. (Page 4, lines 26-32).

Dependent claim 9, which is being argued separately, claims the process of claim 8, wherein the wax conversion in step (a) is between 40 and 60%. (Page 14, lines 19-24, and page 13, line 27 to page 14, line 6).

Dependent claim 11, which is being argued separately, claims the process of claim 10, wherein the pressure in step (a) is between 100 to 150 bar and the pressure in step (b) is between 30 and 60 bar. (Page 13, lines 7-10, and page 19, lines 15-21).

Dependent claim 22, which is being argued separately, claims the process of claim 8, wherein the wax conversion in step (a) is between 45 and 60%. (Page 14, lines 19-24).

Dependent claim 23, which is being argued separately, claims the process of claim 8, wherein gas oil and kerosene product having excellent low temperature properties is separated from the effluent of step (b). (Page 14, lines 11-15).

Dependent claim 24, which is being argued separately, claims the process according to claim 1, wherein a fraction boiling below 370 °C is removed from the effluent of step (a) prior to being contacted with the MTW type zeolite-containing catalyst composition in step (b). (Page 15, lines 16-18).

Dependent claim 25, which is being argued separately, claims the process of claim 24, wherein said fraction removed from the effluent of step (a) is between 5 and 40 wt% of the feed to step (a). (Page 15, lines 16-18).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The rejection of claims 1-10 and 12-23 under 35 USC § 103(a) as being unpatentable over Van Ballegoy et al (WO 00/29511) in view of Nalesnik et al (US 6,103,674).

The rejection of claims 24 and 25 under 35 USC § 103(a) as being unpatentable over Van Ballegoy et al (WO 00/29511) in view of Nalesnik et al (US 6,103,674) in view of Le et al (US 5,306,416).

The grounds of rejection for claim 11 is not specifically stated in the final Office action, but appears to be the same grounds as for claims 1-10 and 12-23, i.e., under 35 USC § 103(a)

as being unpatentable over Van Ballegoy et al (WO 00/29511) in view of Nalesnik et al (US 6,103,674). In a previous Office action the rejection of claim 11 was based on a combination of Van Ballegoy et al and Nalesnik et al with an additional reference, Kasztelan et al (US 6,231,750). It appears this latter reference is no longer being relied on for the rejection of claim 11. If this is not the case, Appellant will address Kasztelan et al in a reply brief.

ARGUMENT

The rejection of claims 1-10, 12-23 and 11 under 35 USC § 103(a) as being unpatentable over Van Ballegoy et al (WO 00/29511) in view of Nalesnik et al (US 6,103,674) is erroneous and should be reversed.

The Present Invention

The present invention provides a process for preparing a lubricant having a dynamic viscosity at -35°C of below 5000 cP by performing specific three steps. The first step (a) involves hydrocracking a feed containing more than 50 wt% wax by contacting the feed in the presence of hydrogen with a catalyst comprising a Group VIII metal component supported on a refractory oxide carrier under hydrocracking conditions sufficient to achieve between 40 and 70 wt% wax conversion (page 2, lines 1-8).

The second step of the present process, step (b), involves catalytically dewaxing the effluent from step (a) by contacting it with specified catalyst composition comprising a noble Group VIII metal, a binder and zeolite crystallites of the MTW type, such as ZSM-12, to obtain a base oil product in high yield having a pour point below -10°C and a viscosity index greater than 120 (page 2, lines 9-13).

The third step of the present process, step (c), involves adding a pour point depressant additive to the catalytically dewaxed base oil product obtained in step (b), to produce the desired lubricant product having a dynamic viscosity at -35°C of below 5000 cP.

Appellant has found that the use of a MTW type zeolite-containing catalyst in catalytic dewaxing step (b) is important to obtaining a lubricant having the dynamic viscosity properties recited in claim 1 (page 21, line 4 to page 23, line 2 and Figs. 1 and 2).

Appellant has also found that the addition of the pour point depressant additive to the catalytically dewaxed base oil product of step (b) resulted in a significantly larger reduction in pour point and a significantly greater reduction in dynamic viscosity as measured by ASTM D 2983, than the addition of the pour point depressant additive to prior art solvent dewaxed oils

(page 2, lines 17-25). This is very advantageous in that it permits the preparation high tier lubricants having low dynamic viscosities and high viscosity indices in high yields from base oils having relatively high pour points (page 2, line 25 to page 3, line 4).

Appellant respectfully submits the process recited in claim 1 employing the aforescribed three steps to produce a lubricant product having the specified dynamic viscosity of below 5000 cP at -35 °C is not taught or reasonably suggested by the cited references as discussed below.

Other claimed embodiments of the inventive process not taught or reasonably suggested by the cited references, are listed below with distinguishing limitations underlined.

Claim 2 claims the embodiment wherein the base oil product from step (b) that is catalytically dewaxed with an MTW type zeolite has a pour point below -20 °C and a viscosity index greater than 130.

Claim 7 claims the embodiment wherein the wax containing feed to step (a) is derived from a Fischer-Tropsch process and the catalyst in step (a) comprises platinum and/or palladium as the Group VIII metal.

Claim 9 claims the embodiment wherein the wax conversion in step (a) is between 40 and 60 %.

Claim 11 claims the embodiment wherein the pressure in step (a) is between 100 to 150 bar and the pressure in step (b) is between 30 and 60 bar.

Claim 22 claims the embodiment wherein the wax conversion in step (a) is between 45 and 60%.

Claim 23 claims the embodiment wherein a gas oil and kerosene product having excellent low temperature properties is separated from the effluent of step (b).

Claim 24 claims the embodiment wherein a fraction boiling below 370 °C is removed from the effluent of step (a) prior to being contacted with the MTW type zeolite-containing catalyst composition in step (b).

Claim 25 claims the embodiment wherein the fraction removed from the effluent of step (a) is between 5 and 40 wt% of the feed to step (a).

Van Ballegoy et al

Van Ballegoy et al (Ballegoy) discloses a catalytic dewaxing process comprising contacting a wax containing feed with a catalyst composition comprising metallosilicate crystallites, a binder and a hydrogenation component, wherein the weight ratio of the metallosilicate crystallites to the binder is between 5:95 and 35:65 (abstract and page 2, lines 1-

3). Any of a variety of metallosilicate crystallites can be used in the catalytic dewaxing process of Ballegoy as long as the weight ratio of the metallosilicate crystallites to the binder is between 5:95 and 35:65. Preferred metallosilicate crystallites are aluminosilicate zeolite crystallites including MFI-type zeolites, such as ZSM-5, TON-type zeolites, such as ZSM-22, and MTW-type zeolites, such as ZSM-12 and MTT-type zeolites, such as ZSM-23, (page 7, lines 5-31).

Ballegoy's objective is to provide a catalytic dewaxing process which can compete with solvent dewaxing in respect of oil yield and viscosity index at the same pour point specification (page 1, lines 19-27). Ballegoy is not concerned with preparation of lubricants having low dynamic viscosities (i.e., below 5000 cP at -35 °C), which is the objective of Appellant's process. There is no mention low dynamic viscosities or data relating to low dynamic viscosities in Ballegoy.

Ballegoy teaches that feeds to the catalytic dewaxing process of the invention may contain between 1 % and up to 100 % of waxy compounds (page 3, lines 4-5). Suitable hydrocarbon oil feeds are said to include mixtures of high boiling hydrocarbons, with vacuum distillate fractions boiling between 300 and 620 °C being particularly suitable (page 3, lines 6-16). Other examples of feeds having relatively high amounts of waxy compounds are said to include synthetic waxy raffinates, hydrocracker bottom fractions and slack waxes (page 3, lines, 27-33). These feeds are said to contain a wax content of at least 50% by weight, preferably at least 80% by weight more preferably at least 90% by weight, and can be used to prepare lubricating base oils having viscosity indices (VI) above 120 and particularly above 135 (page 3, line 28 to page 4, line 3).

Ballegoy also teaches that prior to the catalytic dewaxing process according to the invention, the vacuum distillate fraction or any other sulfur or nitrogen containing feedstock is preferably treated to a hydrotreating step to reduce the concentration of sulfur and/or nitrogen in the feed (page 4, lines 4-9). Suitable hydrotreating catalysts are taught to comprise one or more of nickel or cobalt as the non-noble Group VIII metal (page 4, lines 14-17). Ballegoy does not teach the conditions employed to hydrotreat the feed prior to catalytic dewaxing.

It is important to note that step (a) of Appellant's process is specified to be a hydrocracking step, not just a hydrotreating step as taught on page 4 of Ballegoy. Hydrocracking in step (a) involves reshaping and cracking of large molecules into smaller molecules in addition to desulfurization and denitrification. Moreover, hydrocracking step (a) of Appellant's process must be accomplished under specific conditions, i.e., hydrocracking conditions sufficient achieve between 40 and 70 wt% wax conversion. As one skilled in the art would know, while catalysts used for hydrotreating and for hydrocracking may have similar

compositions, the operating conditions (e.g., temperature and pressure) for hydrotreating and hydrocracking generally are not similar, with hydrocracking conditions being more severe than hydrotreating conditions. Therefore, Ballegoy's disclosure on page 4 of hydrotreating a sulfur and nitrogen containing feed with a hydrotreating catalyst using unspecified conditions, does not teach step (a) of the present process, which is a hydrocracking step performed under hydrocracking conditions sufficient to achieve between 40 and 70 wt% wax conversion.

Ballegoy does indirectly disclose hydrocracking prior to catalytic dewaxing in the Examples 1-5 on pages 17-25, in which various dewaxing catalysts are employed to catalytically dewax two different waxy raffinates referred to as "hydrocracked" waxy raffinates, indicating they had been hydrocracked. The properties of the different hydrocracked waxy raffinates are listed in Tables I and IV, and include wax contents of 16.7 wt% and 30 wt%, respectively. However, the conditions under which these waxy raffinates were hydrocracked are not disclosed, nor is the wax content of the feed, nor the percent of wax conversion. Therefore, the disclosure in Examples 1-5 does not teach step (a) of claim 1, which requires the feed be contacted with a catalyst comprising a Group VIII metal supported on a refractory oxide carrier under hydrocracking conditions sufficient to achieve between 40 and 70 wt% wax conversion.

The catalytic dewaxing process in Ballegoy is somewhat similar to step (b) of the present process which is a catalytic dewaxing step. However, the present claims require the use of a particular zeolite, a MTW-type zeolite, while Ballegoy teaches any of a variety of zeolites, such as MFI-type zeolites, TON-type zeolites or MTW-type zeolites are equally useful (Ballegoy, page 7, line 5 to page 10, line 9). Appellant has found that the use of a MTW type zeolite-containing catalyst in step (b) is important to obtaining a lubricant having the low dynamic viscosity properties recited in claim 1. This is demonstrated by the data in Figures 1 and 2 of the present application, which show the use of a MTW zeolite containing catalyst in step (b) produces a dewaxed oil having a higher viscosity index and yield than a catalyst containing ZSM-5 zeolite, which is the zeolite employed in a majority of the examples in Ballegoy. (The data in Figs. 1 and 2 for the MTW-type zeolite are shown as "squares" while the ZSM-5 zeolite data are shown as "diamonds").

Neither Van Ballegoy et al or Nalesnik et al Are Concerned with Producing a Lubricant Having a Low Dynamic Viscosity, Nor Would the Presently Claimed Process be Obvious from the Cited References Because of Alleged Overlapping Ranges as Contended by the Examiner

As discussed above, the present invention provides a process for preparing a lubricant having low dynamic viscosities (i.e., a dynamic viscosity at -35 °C of below 5000 cP) in high

yields from base oils having relatively high pour points. Lubricants of this type are of considerable importance in the proper operation of various mechanical devices under conditions of extreme cold. Ballegoy is not at all concerned with producing lubricants having low dynamic viscosities, nor is there any specific mention of such lubricants in either the Ballegoy or Nalesnik et al references. Despite this fact, the Examiner contends Appellant's process for producing lubricants having the specified low dynamic viscosity would be obvious because of alleged overlapping ranges between the prior art processes and Appellant's three step process. As discussed in detail below, some of the ranges the Examiner considers overlapping do not, in fact, overlap. To the extent there is any overlap in ranges between the present process and the prior art processes, any presumption of *prima facie* obviousness created by the overlap is believed rebutted by the showings in the examples and figures in the present application, as discussed below.

Ballegoy Does Not Teach or Reasonably Suggest the Limitation in Step (a) of Claim 1 of Hydrocracking Conditions Sufficient to Achieve a 40 to 70% Wax Conversion as Contended by the Examiner

Applicant has found that hydrocracking the feedstock containing more than 59 wt% under conditions sufficient to achieve a 40 to 70 % wax conversion in step (a) significantly affects the overall base oil yield as shown in Fig. 4, and discussed on page 25 of the present specification, lines 15-18. Appellant respectfully submits that Ballegoy does not teach or reasonably suggest the 40 to 70% wax conversion limitation in claim 1, and strongly disagrees with the position taken by the Examiner in paragraph 6 of the final Office action, which reads as follows

“In regards to claim 1, Van Ballegoy teaches a process to prepare a lubricant by hydrocracking feeds containing 50% or preferably at least 90% of waxy compounds (page 3 line 27 – page 4 line 1) in the presence of hydrogen with a Group VIII metal compound supported by a refractory oxide carrier (page 4 lines 8-29) under hydrocracking conditions sufficient to achieve 16.7% or 30% of wax in the hydrocracked product (Table II & IV) which amounts to 40 to 81.4%, overlapping the claimed range.”

Appellant respectfully submits this position is untenable and erroneous for at least the following reasons:

Contrary to the above quoted statement in the final Office action, Ballegoy on page 4, lines 8-29, cited by the Examiner, does not teach hydrocracking or hydrocracking conditions, but

instead teaches hydrotreating a sulfur and nitrogen containing feedstock with a hydrotreating catalyst in order to reduce the concentration of sulfur and nitrogen in the feed (page 4, lines 4-14). There is no disclosure on page 4 of hydrocracking, or of hydrocracking conditions.

A hydrocracked waxy raffinate is used in the examples in Ballegoy. However, the conditions under which these waxy raffinates were hydrocracked are not disclosed, nor is the wax content of the feed or feeds used to produce the waxy raffinates, nor the percent of wax conversion.

While Tables II & IV are mentioned in the above quoted statement, it is believed Tables I & IV was intended, since Table I lists the properties of a hydrocracked waxy raffinate, while Table II does not.

There is a disclosure in Tables I and IV of two different hydrocracked waxy raffinates having wax contents of 16.7 and 30 wt%, respectively. However, there is no disclosure of the percent wax conversion, or of the wax content of the feed which was used to produce the hydrocracked waxy raffinates. Without knowing the wax content of the feed or feeds that were hydrocracked, one can only speculate as to the percent wax conversion, which apparently is what the Examiner has done, as discussed below.

The term “wax conversion” is defined on page 14 of the present specification as (wax in feed to step (a) – wax in effluent of step (a) / (wax in feed to step (a)) x 100%. Therefore, in order to determine the % wax conversion it is necessary to know not only the wax content of the effluent from hydrocracking step (a), but also the wax content of the feed to the hydrocracking step.

From the aforementioned equation it can be seen that the percent wax conversion will vary depending on the wax content of the feed. For example, if the wax content of the feed used to produce the hydrocracked waxy raffinate in Table I was 90 wt%, which apparently is wax content assumed by the Examiner, then the percent wax conversion would be 81.4%. (The calculation would be $90\% - 16.7\% / 90\% \times 100 = 81.4\%$ wax conversion.) If the wax content of the feed used to produce the hydrocracked waxy raffinate in Table IV was 40 %, then the % wax conversion would be 20%. (The calculation would be $40\% - 30\% / 40\% \times 100 = 20\%$ wax conversion.)

Thus, it is not correct to say that a wax content of 16.7 wt% or 30 wt% “amounts to a wax conversion range of 40 to 81.4%”. Ballegoy does not teach a wax conversion range of 40 to 81.4 %. This alleged “wax conversion range” is not a range at all. Instead, it is two calculated numbers based on assumed or hypothetical wax contents in the feed.

While Ballegoy does disclose on page 3, line 27 to page 4, line 1 that feeds such as synthetic waxy raffinates, hydrocracker bottom fractions and slack waxes have wax contents of at least 50 wt%, preferably at least 80 wt% and more preferably at least 90 wt%, Ballegoy does not disclose which of these feeds, if any, was used to produce the hydrocracked waxy raffinates whose properties are listed in Tables I and IV. The feeds may have been a synthetic waxy raffinate, or a slack wax or a hydrowax, or may have been some other wax containing feed having a lower or higher wax content. (On page 3, lines 4-5 of Ballegoy, it is stated the feeds may suitably contain between 1 % up to 100% of waxy compounds.)

In the absence of any disclosure in Ballegoy as to which feed was used to produce the hydrocracked waxy raffinates shown in Tables I and IV, or the wax content of such feed or feeds, or the conditions under which they were hydrocracked, the Examiner's position that the 40 to 70 % wax conversion range recited in step (a) of claim 1 is obvious from the "overlapping range" disclosed in Ballegoy is untenable. Ballegoy doesn't disclose any actual wax conversion range, or provide sufficient information to calculate wax conversion range. Nor is there any teaching or suggestion in Ballegoy that hydrocracking to a particular wax conversion is even important.

The non-obviousness of the wax conversion range recited in step (a) of claim 1 is further evidenced by Figure 4 of the present application, which shows the influence of wax conversion in step (a) on the yield of the dewaxed base oil. As shown in Figure 4 the yield of dewaxed base oil is significantly greater at 50.5 % wax conversion, which is within the claimed range, than at a wax conversion of 75.5% (represented by the small solid circles), which is above the claimed range. It is noted that the 81.4 % wax conversion calculated by the Examiner is even further above the claimed range of 40 to 70%, and presumably would result in even lower yield of dewaxed base oil product than the yield obtained with the 75.5 % wax conversion shown in Fig. 4.

It is also noted that even if the hydrocracked waxy raffinate in Ballegoy was produced under hydrocracking conditions which inherently resulted in a percent wax conversion within the range cited in step (a), this is only one of a number of limitations which are required in order to produce a lubricant having the specified dynamic viscosity of below 5000 cP at – 35 °C. Without knowing the other limitations, one skilled in the art would still not know how to prepare a lubricant having a dynamic viscosity of below 5000 cP at – 35 °C, nor would it be obvious to modify Ballegoy to produce such a lubricant, since Ballegoy is not concerned with lubricants having low dynamic viscosities.

Ballegoy Does Not Teach Certain Limitations in Step (b) in Claim 1

On page 3 of the final Office action it is stated that: “Ballegoy teaches high yields with overlapping ranges of the pour point and viscosity index (VI) values of claim (See Table I – VII)”. As discussed below, Ballegoy does not teach ranges overlapping a pour point of below –10 °C and a viscosity index of greater than 120 recited in claim 1 for the base oil product produced in step (b) which requires the use of MTW type zeolite-containing catalyst. Claim 2 recites even more severe pour point and viscosity index values for the product of step (b), (i.e., a pour point of below –20 °C and a viscosity greater than 130 and below 180).

A careful review of all of the tables in Ballegoy (Tables I – XII, on pages 18-30) reveals that base oil products therein disclosed are different from the base oil product recited in step (b) of claim 1, and do not have overlapping ranges of pour point and viscosity index values as alleged by the Examiner.

Table I on page 18 list the properties of the hydrocracked waxy raffinate prior to being catalytically dewaxed with a MTW type zeolite containing catalyst. Thus, the hydrocracked waxy raffinate shown in Table I to have a pour point of +27 °C and a VI of 121 does not teach the limitations of claim 1, which requires that base oil product produced in catalytic dewaxing step (b) (i.e., the base oil product after catalytic dewaxing with a MTW zeolite-containing catalyst) has a pour point of below –10 °C and a viscosity index of greater than 120. Ballegoy's teachings in Table I show the properties of the feed to the catalytic dewaxing step. Not the product produced in the catalytic dewaxing step.

Table II on page 20 lists the viscosity indices of six catalytically dewaxed products. The viscosity indices ranged from 101 to 108, which is well below the viscosity indices specified in the present claims for the base oil product of step (b).

Table III on page 21 lists the viscosity indices of two catalytically dewaxed products. Their viscosity indices are 108 and 104, also well below the viscosity indices specified in the present claims for the base oil product of step (b).

Table VI on page 22 lists the properties of a hydrocracked waxy raffinate before catalytic dewaxing and does not show a viscosity index.

Table V on page 24 lists the viscosity indices of three catalytically dewaxed products. The viscosity indices range from 90 to 97, also well below the viscosity indices specified in the present claims for the base oil product of step (b).

Table VI on page 26 lists the composition and flat plate crushing strengths of various catalysts. No viscosity indices are listed.

Table VII on page 27 lists the properties of a wax containing feedstock before catalytic dewaxing. No viscosity index is given.

Table VIII on page 28 lists the viscosity of a product which was catalytically dewaxed using a ZSM-5 (a MFI type zeolite). Although this product had a viscosity index of 151, it was obtained using a different type of catalyst than the MTW type zeolite specified in claim 1 for step (b).

Table IX on page 28 lists the properties of a hydrowax before catalytic dewaxing. No viscosity index is given.

Table X on page 29 lists the viscosity of a product which was catalytically dewaxed using a ZSM-5 zeolite. This product had a viscosity index of 95, which is below the viscosity indices specified in the present claims. Also a different zeolite catalyst is used for dewaxing than the MTW type zeolite specified in the present claims.

Table XI on page 28 listed the properties of a finished base oil. No viscosity index is given.

Table XII on page 30 lists the viscosity of a product which was catalytically dewaxed using a ZSM-5 zeolite. Although this product has a viscosity index of 136, it was obtained using a different type of catalyst than the MTW type zeolite specified in the present claims.

To summarize, most of the base oil products prepared in the examples in Ballegoy were prepared using a catalysts containing zeolites different from the MTW type zeolite specified in step (b) of the present process. Those base oil products in Ballegoy which were prepared using a catalyst comprising an MTW type zeolite (Examples 2a, 2b and 2c) had viscosity indices well below the greater than 120 specified in claim 1, and greater than 130 and below 180 specified in claim 2.

Van Ballegoy Alone or in Combination with Nalesnik Does Not Teach Step (c) of Claim 1

As recognized by the Examiner, the primary Ballegoy reference does not teach step (c) of present claim 1, which involves adding a pour point depressant additive to the catalytically dewaxed base oil product obtained in step (b). Nalesnik et al is apparently relied on for this teaching. However, Ballegoy and Nalesnik combined do not teach or reasonably suggest the claimed process for preparing lubricants having low dynamic viscosities for the reasons discussed below.

Nalesnik et al

Nalesnik et al discloses a novel class oil-soluble molybdenum-based multifunctional friction modifier additives comprising the reaction product of an unsaturated or saturated ester or acid, a diamine, carbon disulfide and a molybdenum compound (Abstract). Nalesnik et al does disclose in col. 12, lines 44-63, that a number of other additives, including a pour point depressant, can be blended into a base oil together with the molybdenum-based friction modifiers. However, Nalesnik makes no distinction as to which base oils the additives should be added, and in fact teaches that any of a variety of natural or synthetic base oil stocks are suitable (col.13, lines 41-56). Nalesnik et al also teaches that the base oil stocks derived from hydroisomerization of wax can be used either alone or on combination with natural and/or synthetic base stocks, and that the resulting isomerase products are typically subjected to solvent dewaxing and fractionation to recover various fractions of specific viscosity range (col. 14, lines 29-32 and 37-40).

Appellant has found (as demonstrated by the data presented in Fig. 5 of the present application) that the base oil to which the pour point additive is added is very important to achieving the desired dynamic viscosity. As shown in Fig. 5, the catalytically dewaxed base oil obtained in step (b) of Appellant's process (which involves catalytic dewaxing with a catalyst containing an MTW-type zeolite) has a superior dynamic viscosity and lower pour point compared to base oils prepared by solvent dewaxing, such as the base oils in which Nalesnik et al teaches its multifunctional friction modifier additives and other additives can be suitably used.

Therefore, present claim 1, which requires the addition of a pour point depressant to a very specific "base oil", i.e., the catalytically dewaxed base oil product obtained in step (b), in order to obtain a lubricant having the desired dynamic viscosity of below 5000 cP at -35 °C, is believed to be patentable over Nalesnik et al, alone or in combination with Ballegoy, since neither reference is concerned with the preparation of lubricants having low dynamic viscosities, and since Nalesnik et al teaches the type and nature of base oil to which the additives are added is not important, contrary to the showing in Fig. 5 of the present application.

For all the above reasons, claim 1 (and claims 2-10, 12-23 and 11), all of which are directly or indirectly dependent on claim 1, and therefore contain the limitations of claim 1), are believed to be patentable over Ballegoy either alone or in combination with Nalesnik et al. .

Dependent Claims 2, 7, 9, 11, 22 and 23 Are Patentable over Ballegoy in View of Nalesnik for the Additional Reasons Presented Below

Claim 2 contains limitation that base oil product from step (b) that was catalytically dewaxed with an MTW type zeolite has a pour point below -20 °C and a viscosity index greater than 130. None of the catalytically dewaxed base oil products prepared using an MTW type zeolite in Ballegoy has a pour point and viscosity index in the claimed range. In paragraph 7 of the final Office action it is stated that “Ballegoy and Nalesnik combined teach a process wherein the oil has a viscosity index of 151 and a pour point of -30 (Ballegoy; page 28, Table VIII)”.

This statement is true, but overlooks a very relevant fact that that the lubricating base oil whose properties are shown in Table VIII of Ballegoy was prepared using a catalyst consisting of ZSM-5, which is a an MFI type zeolite. The present claims require that a MTW type zeolite, such as ZSM-12, be used in step (b) of the to produce the base oil product which in turn is used to prepare the lubricant having a dynamic viscosity at -35 °C below 5000 cP.

The data shown in Figures 1 and 2 of the present application (which were generated in Example 1 and Comparative Experiment A on pages 21-23 of the present specification) demonstrate that base oils products produced by dewaxing a hydrocracked slack wax using a dewaxing catalyst based of a MTW type zeolite, can be obtained in higher yields with higher viscosity indices than base oil product catalysts prepared in a similar manner, but dewaxed with a catalyst based on ZSM-5 (a MFI type zeolite).

Claim 7 contains the limitations that the wax containing feed to step (a) is derived from a Fischer-Tropsch process, the Group VIII metal in the catalyst in step (a) (the hydrocracking step) comprises platinum and/or palladium, and the total effluent from step (a) is used as feed to step (b) in series flow. In paragraph 12 of the final Office action the Examiner addresses the series flow limitation in claim 7, but fails to address the limitation in claim 7 that the Group VIII metal in step (a) is platinum and/or palladium.

Ballegoy teaches that prior to catalytically dewaxing a sulfur and nitrogen containing feedstock may be treated to a hydrotreating step employing catalysts comprising a non-noble Group VIII metal such as nickel or cobalt (page 4, lines 14-19). However, Ballegoy does not teach employing noble Group VIII metals, such as platinum and/or palladium, in the catalyst used in the hydrotreating step prior to catalytic dewaxing. Thus, claim 7 is believed to be patentable over Ballegoy for this additional reason.

Claim 9 contains the limitation that the wax conversion in step () is between 40 and 60 %. As discussed above in connection with claim 1, Ballegoy does not disclose a wax conversion

range, nor can a range be calculated using the information listed in Tables I and IV because the wax content of the feed used to produce the hydrocracked waxy raffinate is not known. In paragraph 14 of the final Office action the Examiner contends that Ballegoy and Nalesnik combined teach a process comprising a conversion of for example 55% of wax or a yield of 45% during the hydrocracking process or step (a) and cites Ballegoy, page 28, Table VIII in support of this contention. The cited portion of Ballegoy does not support the Examiner's contention. The properties shown in Table VIII on page 28 are for a base oil product obtained by contacting a wax containing feedstock obtained by a Fischer-Tropsch process followed by a mild hydroconversion with a catalyst consisting of 30 wt% ZSM-5, 70 wt% silica and 0.7 wt% platinum. The 45 wt% yield in Table VIII refers to the yield of the lubricating base oil product from the catalytic dewaxing experiment described in Example 11 (Page 27, lines immediately above Table VII). Thus, the 45 wt% yield in Table VIII of Ballegoy is not the yield from a hydrocracking step (a) as contended by the Examiner, and has no relevance to limitation in claim 9 that the wax conversion in hydrocracking step (a) is between 40 and 60 %.

Claim 11 contains the limitation that the pressure in step (a) is between 100 to 150 bar and the pressure in step (b) is at a lower pressure between 30 and 60 bar. While Ballegoy discloses a pressure range for catalytic dewaxing which overlaps the pressure range recited for step (b) of the present process, Ballegoy does not disclose a pressure range for the hydrotreating step prior to catalytic dewaxing (which the Examiner considers similar to step (a) of present process). In paragraph 15 of the final Office action, the Examiner takes the position that step (a) in the Appellant's process must have intrinsically been performed at similar pressure conditions as Ballegoy because "the product has an overlapping rate of conversion as previously stated." As discussed above with regard to claim 9, the product shown in Table VIII, page 28 of Ballegoy is the product of catalytic dewaxing, not the product of step (a) which is a hydrocracking step. Therefore, the Examiner has not established an "overlapping rate of conversion". Even if there was an overlap in conversion rates, this still would establish that the respective processes were operated at similar pressure conditions, because other operating conditions, such as temperature, also affect the conversion rate. Thus, Ballegoy does not teach, either expressly or intrinsically, the pressure ranges recited in claim 11. Therefore, claim 11 is patentable for this reason, in addition to those discussed above in connection with claim 1.

Claim 22 contains the limitation that the wax conversion in step (a) is between 45 and 60%. As discussed above in connection with claim 1, Ballegoy does not disclose a wax conversion range, nor can a range be calculated using the information listed in Tables I and IV because the wax content of the feed used to produce the hydrocracked waxy raffinate is not

known. As discussed above in connection with claim 9, Examiner's contention in paragraph 14 of the final Office action, that Ballegoy and Nalesnik combined teach a process comprising a conversion of for example 55% of wax or a yield of 45% during the hydrocracking process or step (a) is not supported by the results shown in Table VIII, page 28 of Ballegoy. The 45 wt% yield in Table VIII refers to the yield of the lubricating base oil product from the catalytic dewaxing experiment described in Example 11 (Page 27, lines immediately above Table VII). The 45 wt% yield in Table VIII is not the yield from a hydrocracking step (a) as contended by the Examiner, and has no relevance to limitation in claim 22 that the wax conversion in hydrocracking step (a) is between 45 % and 60 %.

Claim 23 contains the limitation that a gas oil and kerosene product having excellent low temperature properties is separated from the effluent of step (b). In paragraph 17 of the final Office action it is stated that:

“In regards to claim 23, Ballegoy and Nalesnik combined teach a process wherein the hydrocracking step (a) occurs at a temperature of from 200 to 500 °C (Ballegoy, page 5 lines 9-13) which overlaps the cracking temperatures for kerosene fractions that ranges from 150 to 275 °C and gas oil that ranges from 175 to 600 °C. Thus kerosene and gas oil products are intrinsically present.”

From this statement it appears the Examiner may have confused the hydrocracking step (a) with the catalytic dewaxing step (b). The 200 to 500 °C temperature range disclosed on page 5, lines 9-13 of Ballegoy is said to be the typical operating temperature for catalytic dewaxing, which is step (b) in Appellant's process. There is no temperature range given for the hydrotreating step in Ballegoy, which is used to reduce the concentration of sulfur and/or nitrogen prior to catalytic dewaxing (see the disclosure on page 4 of Ballegoy, lines 4-29). More importantly, the limitation in claim 23 specifies that the gas oil and kerosene product having excellent low temperature properties is separated from the effluent of step (b). Even if the Examiner's contention that “kerosene and gas oil products are intrinsically present” is correct, this does not meet the limitation in claim 23 that a gas oil and kerosene product be separated from the effluent of step (b). Being intrinsically present is clearly not the same as being separated from an effluent, which is the limitation in claim 23.

The rejection of claims 24 and 25 under 35 USC § 103(a) as being unpatentable over Van Ballegoy et al (WO 00/29511) in view of Nalesnik et al (US 6,103,674) in view of Le et al (US 5,306,416) is erroneous and should be reversed.

Claim 24 claims the process of claim 1 wherein a fraction boiling below 370 °C is removed from the effluent of step (a) prior to being contacted with the MTW type zeolite-containing catalyst composition in step (b). **Claim 25** claims the process of 24 wherein the fraction removed from the effluent of step (a) is between 5 and 40 wt% of the feed to step (a).

In paragraph 22 of the final Office action the Examiner acknowledges that Ballegoy and Nalesnik combined to not teach separating a fraction of the hydrocracked effluent prior to being catalytically dewaxed, but contends the removal of such a fraction would have been obvious based on the teachings of Le et al, in particular Example 6 of Le et al.

According to the Examiner: "In Example 6, Le teaches that hydrocracked wax having 72% yield can be subjected to dewaxing, wherein only 43 % of the hydrocracked wax undergoes the dewaxing process." Appellant respectfully submits the Examiner has misinterpreted Example 6 of Le et al, which lead to the erroneous conclusion that the subject matter claimed in claims 24 and 25 is obvious.

Le et al disclose a process for making a blended lubricant having a higher than predicted viscosity by blending a lubricant having a lower viscosity with a lubricant which has been treated with an organic peroxide such as di-tertiary butyl peroxide to increase the viscosity index (abstract, col. 5, lines 31-44). In Example 6 of Le et al (which is described in col. 16, line 65 to col. 17, line 30) a slack wax was hydrocracked over a commercial Ni/W/Al/F catalyst giving a 72 wt% yield of 610 °F + product (col. 17, lines 3-8). This product was hydrodewaxed with a Pt/ZSM-23 catalyst giving a 60 wt% yield of 610 °F + product having a pour point of +10 °F (col. 17, lines 9-14). The overall yield based on the wax charge was 43 wt% (col. 17, lines 14-15). A 50 gram portion of the product from the hydrodewaxing step was reacted with DTBP (di-tertiary butyl peroxide) to produce the DTBP treated product shown in Table 7.

Applicant respectfully submits there is no support in Example 6 of Le et al for the Examiner's contention that "only 43% of the hydrocracked wax undergoes the dewaxing process". It is clearly stated in col. 17, lines 9-10 of Le et al that "This product" (meaning the entire 610 °F + product from the hydrocracking step) "was subjected to hydrodewaxing". There is no disclosure in Le et al of separating between 5 and 40 wt% of a fraction boiling below 370 °C as recited in claims 24 and 25. The 43 wt% mentioned in col. 17, line 15, clearly refers to the overall yield based on the wax charge. The overall yield is calculated by multiplying the 72

wt% yield from the hydrocracking step, by the 60 wt% yield from the hydrodewaxing step, which equals approximately 43 % overall yield. There is absolutely no teaching or suggestion in Example 6 that “only 43% of the hydrocracked product undergoes dewaxing.” Thus, the rejection of claims 24 and 25 is erroneous and should be reversed for this reason, as well as those discussed above in connection with claim 1.

Conclusion

For all the above reasons, claims 1-25 of the present application are believed to be patentable over the cited references. Accordingly, the action of the Examiner in finally rejecting these claims should be reversed, which action is respectfully requested.

Respectfully submitted,

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CLAIMS APPENDIX

1. A process to prepare a lubricant having a dynamic viscosity at -35°C of below 5000 cP by performing the following steps:
 - (a) hydrocracking a feed containing more than 50 wt% wax by contacting said feed in the presence of hydrogen with a catalyst comprising a Group VIII metal component supported on a refractory oxide carrier under hydrocracking conditions sufficient to achieve between 40 and 70 wt% wax conversion; and
 - (b) catalytically dewaxing at least part of the effluent of step (a) with a catalyst composition comprising a noble Group VIII metal, a binder and zeolite crystallites of the MTW type to obtain a base oil product in high yield having a pour point below -10°C and having a viscosity index greater than 120; and
 - (c) adding a pour point depressant additive to the base oil product obtained in step (b) thereby obtaining a lubricant having a dynamic viscosity at -35°C of below 5000 cP.
2. The process according to claim 1, wherein the base oil product in step (b) has a pour point below -20°C and a viscosity index greater than 130 and below 180.
3. The process according to claim 2, wherein the noble Group VIII metal in step (b) is platinum and the binder in step (b) is a low acidity binder which binder is essentially free of alumina.
4. The process according to claim 3, wherein the binder is silica.
5. The process according to claim 4, wherein the zeolite crystallites have been subjected to a selective surface dealumination process.
6. The process according to claim 5, wherein the selective surface dealumination process comprises contacting the zeolite crystallites with an aqueous solution of a fluorosilicate salt wherein the fluorosilicate salt is represented by the formula:
$$(A)_2/b\text{SiF}_6$$
wherein 'A' is a metallic or non-metallic cation other than H^+ having the valence 'b'.

7. The process according to claim 6, wherein the wax containing feed is derived from a Fischer-Tropsch process, the Group VIII metal in step (a) is platinum and/or palladium and wherein the total effluent of step (a) is used as feed to step (b) in a series flow configuration.

8. The process according to claim 1, wherein the feed to step (a) comprises at least 700 ppm sulfur, the catalyst used in step (a) is a pre-sulphided catalyst comprising a Group VIB metal and a non-noble Group VIII metal and wherein the total effluent of step (a) is used as feed to step (b) in a series flow configuration.

9. The process according to claim 8, wherein the wax conversion in step (a) is between 40 and 60%.

10. The process according to claim 1, wherein the feed to step (a) comprises between 700 and 2000 ppm sulfur, the catalyst used in step (a) is a pre-sulphided catalyst comprising a Group VIB metal and a non-noble Group VIII metal and wherein at least part of the ammonia and hydrogen sulphide which is present in the effluent of step (a) is separated from said effluent prior to using said effluent as feed of step (b).

11. The process according to claim 10, wherein the pressure in step (a) is between 100 to 150 bar and the pressure in step (b) is between 30 and 60 bar.

12. The process according to claim 11, wherein the catalyst used in step (a) is a pre-sulphided hydrodesulphurisation catalyst comprising nickel and tungsten on an acid amorphous silica-alumina carrier.

13. The process according to claim 12, wherein the sulphided hydrodesulphurisation catalyst has a hydrodesulphurisation activity of higher than 30%, wherein the hydrodesulphurisation activity is expressed as the yield in weight percentage of C₄-hydrocarbon cracking products when thiophene is contacted with the catalyst under standard hydrodesulphurisation conditions, wherein the standard conditions consist of contacting a hydrogen-thiophene mixture with 200 mg of a 30-80 mesh catalyst at 1 bar and 350 °C, wherein the hydrogen rate is 54 ml/min and the thiophene concentration is 6 vol% in the mixture.

14. The process according to claim 13, wherein the hydrodesulphurisation activity of the catalyst is lower than 40%.

15. The process according to claim 14, wherein the hydrodesulphurisation catalyst is obtained in a process wherein nickel and tungsten are impregnated on the acid amorphous silica-alumina carrier in the presence of a chelating agent.

16. The process according to claim 15, wherein the alumina content of the hydrodesulphurisation catalyst is between 10 and 60 wt% as calculated on the carrier alone.

17. The process according to claim 16, wherein the silica-alumina carrier has an n-heptane cracking test value of between 310 and 360 °C, wherein the cracking test value is obtained by measuring the temperature at which 40 wt% of n-heptane is converted when contacted, under standard test conditions, with a catalyst consisting of said carrier and 0.4 wt% platinum.

18. The process according to claim 17, wherein the silica-alumina carrier has an n-heptane cracking test value of between 320 and 350 °C.

19. The process according to claim 18, wherein the catalyst comprises between 2-10 wt% nickel and between 5-30 wt% tungsten.

20. The process according to claim 19, wherein the surface area of the hydrodesulphurisation catalyst is between 200 and 300 m²/g.

21. The process according to claim 20, wherein the total pore volume of the hydrodesulphurisation catalyst is above 0.4 ml/g.

22. The process according to claim 8, wherein the wax conversion in step (a) is between 45 and 60%.

23. The process according to claim 8, wherein gas oil and kerosene product having excellent low temperature properties is separated from the effluent of step (b).

24. The process according to claim 1, wherein a fraction boiling below 370 °C is removed from the effluent of step (a) prior to being contacted with the MTW type zeolite-containing catalyst composition in step (b).

25. The process according to claim 24, wherein said fraction removed from the effluent of step (a) is between 5 and 40 wt% of the feed to step (a).

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None